

AB wherein said motion tracker and predictor predicts predefined motion characteristics using a Kalman filter equation for each predefined motion mode and weighs the predefined probabilities associated with said motion modes, to generate an overall prediction for each said motion characteristic.

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**IN THE SPECIFICATION:**

Please amend paragraphs 8, 30, 35, 45, 47, 80, and 81 as set forth immediately below in clean form. Additionally, in accordance with 37 CFR 1.121 (b)(iii), all paragraphs amended herein are set forth in a Marked Up Version on the sheets attached to this amendment.

AB [0008] A camera or some other sensor is used to capture an ambient image, the image of the occupant and the area surrounding the occupant. A segmented image, the image of the occupant with the surrounding area removed from the image, is obtained through a process called segmentation. The segmented image is then subjected to a shape fitting process that fits an upper shape to the upper torso of the occupant. A lower shape is fitted from the occupant's hips down to the occupant's feet. The two shapes can overlap at one point, the centroid of the occupant, in the area of the occupant's hips. In the preferred embodiment, an ellipse is the shape used and the relevant centroid is the centroid of the upper ellipse.

AB [0030] The segmented image 42 of the occupant is then subject to an ellipse fitting routine 44. An upper ellipse is fitted around the upper torso of the occupant 18. The upper torso includes everything from the occupant's 18 head down to the occupant's hips. A lower ellipse is fitted from the occupant's 18 toes up to the occupant's 18 hips. Both ellipses overlap at one point which can be referred to as the centroid, but the centroid 54 is preferably identified as the center of the upper ellipse 58. The output of the ellipse fitting routine 44 will be discussed in greater detail below along with the discussion relating to Figs. 4, 5, and 6. The process and practice of generating an upper ellipse, a lower ellipse, and a centroid to represent different parts of the occupant 18 is well known in the art. In the preferred embodiment of the invention, the ellipse fitting routine 44 is applied by the computer system

A3 30, but in other embodiments, the ellipse fitting routine 44 could be performed by a separate computer from the computer system at 30.

A4 [0035] Fig. 4 illustrates the ellipse fitting routine 44 implemented by the computer system 30. The upper ellipse 58 extends from the hips up to the head of the occupant 18. The lower ellipse 56 extends down from the hips to include the feet of the occupant 18. If the entire area from an occupant's 18 hips down to the occupant's 18 feet is not visible, a lower ellipse is generated to represent what is visible. Both ellipses overlap at a point that can be known as the centroid 54, although the centroid 54 is preferably the center of the upper ellipse 58. In non-preferred embodiments, shapes other than ellipses are used to represent the upper and lower parts of an occupant 18. The ellipse fitting routine is well known in the art. The image processing system need not utilize the lower ellipse 56, and it is preferable to generate the centroid 54 with respect to the upper ellipse 58.

A5 [0045] Similarly, the probability of human to human is  $P^{H-H}$  at 116, human to stationary is  $P^{H-S}$  at 112, and human to crash is  $P^{H-C}$  at 120, and stationary to crash  $P^{H-C}$  is 90. The total probabilities resulting from an initial state of stationary 102 must add up to 1.

$$P^{H-H} + P^{H-C} + P^{H-S} = 1.0$$

A6 [0047] As a practical matter, it is highly unlikely but not impossible for an occupant 18 to ever leave the state of crash at 122 once that state has been entered. Under most scenarios, a crash at 122 ends the trip for the occupant 18. Thus, in the preferred embodiment,  $P^{C-H}$  is set to a number very close to zero and  $P^{C-S}$  is also set to number very close to zero. The three equations for motion mode probabilities in the preferred embodiment are as follows:

$$P^{C-C} + P^{C-H} + P^{C-S} = 1.0$$

$$P^{H-H} + P^{H-C} + P^{H-S} = 1.0$$

$$P^{S-C} + P^{S-H} + P^{S-S} = 1.0$$

A7 [0080] Next, the actual likelihood for each motion vector is calculated.

$$\text{Likelihood} \begin{pmatrix} C \\ H \\ S \end{pmatrix} = e^{-\frac{(\text{residue} - \text{offset})^2}{2\sigma^2}}$$